NEW RECORDS OF MARINE ISOPODS (CRUSTACEA: PERACARIDA) FROM THE BAHAMAS, WITH DESCRIPTIONS OF TWO NEW SPECIES OF EPICARIDEANS

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ABSTRACT

A total of 222 isopod specimens was collected during a survey of six different marine habitat types on Andros Island, Bahamas. These specimens represent ~30 species, of which 23 were recorded for the first time from the Bahamas. New species of *Pseudione* and *Hemiarthrus* are described, two undescribed species of *Cabirops* are discussed, and a list of the ten species of *Pseudione* known to parasitize hermit crabs is provided.

The marine isopods of the Caribbean are perhaps the best known of the peracarid crustaceans in that region. All pre-1989 information for Caribbean isopods was summarized by Kensley and Schotte (1989), although the epicaridean section contained only a list of the bopyrid species with their known hosts and the other epicaridean families were not included. Subsequently, several papers have been published which have added substantially to our knowledge of the composition and distribution of this isopod fauna, especially in select localities such as Colombia (Müller, 1989; 1990a,b; 1992; Kensley and Schotte, 1994); Martinique (Müller, 1991; 1993a,b); Venezuela (Delgado et al., 2000); Bermuda (Kensley, 1994); and the Lesser Antilles (Kensley and Schotte, 1994). However, much is still unknown regarding the distribution of isopods in many areas within the Caribbean, such as the Bahamas, as evidenced by the high number of new Bahamian records provided herein and the fact that one of them is a first record for a species that has otherwise been well documented in other parts of the Caribbean: *Cirolana parva* Hansen, 1890.

One of us (CBB) collected samples of isopods, as well as other crustaceans, from localities on Andros Island, Bahamas during August and September 2000. These samples were taken as part of a benthic habitat survey designed to provide data as to the efficacy of using spectral remote sensing as a proxy for conspicuous marine taxa (e.g., corals, algae, fish) and, in turn, to indicate whether "macro-taxon" assessment can be extrapolated to the "cryptic" taxa (e.g., crustaceans, mollusks, echinoderms; Brumbaugh et al., unpubl. data).

Thirty species of isopods were collected, 23 of which represented new records for the Bahamas. Additionally, 347 specimens of hermit crabs were collected, representing 23 species; all of these, as well as the other decapods, were examined for isopod parasites. Most of the epicaridean isopods were collected from hermit crab hosts, although a few were from alpheid shrimp and xanthid brachyurans. Two species of epicarideans (bopyrids), one from a hermit crab and one from a shrimp, are new to science and are described. Two additional species of cabiropsid hyperparasitic epicarideans are discussed but not formally described. Information is given on range, hosts (for parasites), and other faunistic associations.

Materials and Methods

Invertebrates were collected both quantitatively and qualitatively at over 30 sites on and around Andros Island, Bahamas from 26 August–8 September, 2000. Coordinates of each locality were

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determined with a GPS device. Surveys were replicated (n = 3) across six benthic habitat types: lagoon; seagrass meadows; uncolonized pavement; raised patch reef; reef crest; and fore reef. At each replicate site, quantitative samples (from 1-m^2 quadrats; *Q*) were taken, followed by qualitative roving (*R*) searches intended to maximize observed species richness. Sampling within the quadrats was necessarily destructive in order to extract cryptic taxa. Specimens were rough sorted in the laboratory on Andros and preserved in 70% ethanol. The shells of hermit crabs were cracked using a vise and the crabs removed; all decapods were examined for parasites.

Drawing tube sketches made of the specimens were scanned into a Macintosh™ computer. Images were then prepared using the programs Adobe Photoshop™ and Adobe Illustrator™.

Shield length (SL) is provided as an indicator of size for host hermit crabs; carapace length (CL) is given as an indicator of size for shrimp and brachyurans. Isopod size is given as total body length (anterior margin of head to posterior margin of pleotelson). Measurements were made to 0.01 mm using an ocular micrometer.

Specimens were deposited in the Division of Invertebrate Zoology, American Museum of Natural History, New York (AMNH). The holotype and paratypes of *Pseudione novaeguineensis* were borrowed from the Natural History Museum of Los Angeles County, California (LACM).

Systematics

Suborder Anthuridea Leach, 1814

Family Anthuridae Leach, 1814

Amakusanthura magnifica (Menzies and Frankenberg, 1966)

(Fig. 1)

Apanthura magnifica Menzies and Frankenberg, 1966: 40, 41, fig. 17.
Amakusanthura magnifica Kensley and Schotte, 1989: 20, 21, figs. 4,5. Kensley, 1994: 320.
Amakusanthura paramagnifica Müller, 1992: 32–38, figs. 1–23 (new synonymy).

Material examined.—One female (7.1 mm), Station 120 Q5, transect from 24°54′47.34″N, 77°53′16.48″W–24°54′47.80″N, 77°53′15.47″W, patch reef, 2.4 m at crest, Andros Island, Bahamas, coll. P. M. Mikkelsen and G. Hendler, 30 Aug. 2000 (AMNH 18205). Four females, Station 21, between North Beach and Engineer's Point, St. Catherines Island, Liberty Co., Georgia, coll. C. B. Boyko, J. Slapcinsky, A. D. Harvey, and J. Williams, 17 May 1998 (AMNH 18153).

Distribution.—Georgia; Florida; Cuba; the Gulf of Mexico (Kensley and Schotte, 1989); Bermuda (Kensley, 1994); Colombia (Müller, 1992); Bahamas (herein).

Remarks.—We initially chose to identify this specimen with the Colombian *A. paramagnifica*, rather than *A. magnifica*, despite our concerns that the two species were hard to distinguish. The Bahamas' specimen has the diagnostic five pairs of long setae on the dorsal surface of the telson, as in *A. paramagnifica*, rather than the two pairs found in the holotype of *A. magnifica* (fide Müller, 1992). Our specimen also has three pairs of short and two pairs of long setae on the distal margin of the telson (Fig. 1A), the number but not the arrangement of setae on the holotype of *A. paramagnifica* (Fig. 1B). The holotype of *A. magnifica* has two pairs of short and two pairs of long setae (Fig. 1C).

We subsequently compared the Bahamas' specimen to the four female specimens of *A. magnifica* (AMNH 18153) from a location near the type locality of that species (off Georgia, 30°48′05″N, 80°W, 461 ft, fide Menzies and Frankenberg, 1966). Three of these *A. magnifica* possessed five pairs of long setae on the dorsal telson surface, while the fourth

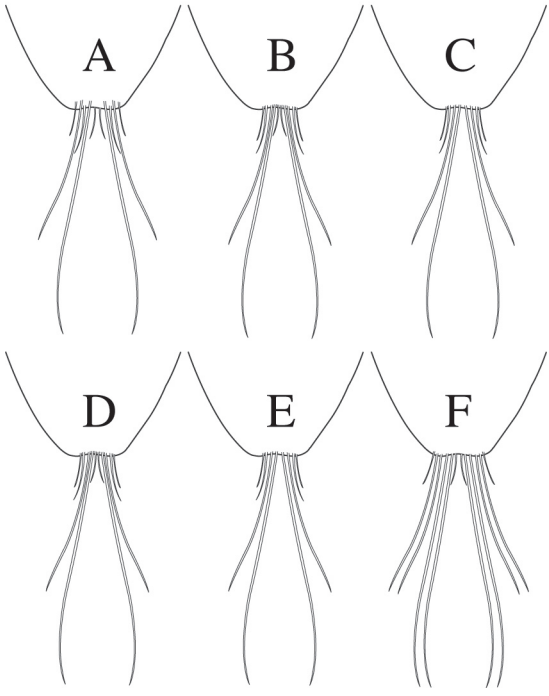

Figure 1. *Amakusanthura magnifica* (Menzies and Frankenberg, 1966). Semidiagrammatic drawings of the number and arrangement of setae on the distal margin of the telson. A, Bahamas specimen, AMNH 18205; B, *A. paramagnifica* Müller, 1992, holotype; C, *A. magnifica*, holotype; D-F, Georgia specimens, AMNH 18153.

had only one pair. Additionally, the number and arrangement of setae on the posterior margin of the telson in the Georgia specimens was highly variable, being either two pair short and two pair long, two pair short and four pair long, or three pair short and two pair long (Figs. 1D–F). All other putative characters distinguishing *A. paramagnifica* from *A. magnifica* are a matter of degree rather than discrete character states (e.g., pereopod one carpus projection, concavity of distal margin of uropodal exopodite).

Because *A. paramagnifica* is known from only two specimens, and the primary differentiating characters (setae on dorsal telson surface and setae on telson distal margin) vary and overlap between the two "species," we conclude that *A. paramagnifica* is a junior synonym of *A. magnifica*, and the range of the *A. magnifica* should be correspondingly extended to Colombia. This is the first record for *A. magnifica* from the Bahamas.

Mesanthura paucidens Menzies and Glynn, 1968

Mesanthura paucidens Menzies and Glynn, 1968: 27, 28, figs. 9a–g. Kensley and Schotte, 1989: 51, figs. 19a, 21e–i. Markham et al., 1990: 413. Müller, 1991: 745–750, figs. 30–58.

Material examined.—One female (2.4 mm), Station 043, 24°53′01.6″N, 77°52′50.5″W, fore reef, 11.5 m, Andros Island, Bahamas, coll. P. M. Mikkelsen et al., 1 Sep. 2000 (AMNH 18206).

Distribution.—Puerto Rico (Menzies and Glynn, 1968); Looe Key, Florida; Belize; Jamaica (Kensley and Schotte, 1989); Quintana Roo, Mexico (Markham et al., 1990); Martinique (Müller, 1991); Tobago; Colombia (Kensley and Schotte, 1994); Bahamas (herein).

Remarks.—This specimen most closely resembles *M. bermudensis* Kensley, 1994, from Bermuda in color pattern. The pigmentation is almost entirely across the dorsum of the segments, with only a distinctive minute lobed pigment-free area medially, and the individual chromatophores on the cephalon are all large. It does not resemble any reported specimens of *M. paucidens* as closely in terms of color pattern (Menzies and Glynn, 1968; Kensley and Schotte, 1989; Müller, 1991). However, our specimen agrees with *M. paucidens* in that it has two pairs of long setae and one pair of plumose setae on the posterior margin of the telson, rather than the four pairs of long setae, two pairs of short simple setae, and one pair of plumose setae, as found in *M. bermudensis* (but see above for difficulties with this character in *A. magnifica*). The differences between *M. bermudensis* and *M. paucidens* are, as noted by Kensley (1994) "seemingly small," and the strong agreement in color pattern between the Bahamas specimen and *M. bermudensis* further suggest that the two species may be found synonymous. Such a synonymy is beyond the scope of this paper and we have chosen to identify our specimen with *M. paucidens*, in as much as it agrees with that species morphologically, if not as clearly in color pattern. Co-occurring isopods were *Metacirolana menziesi* Kensley, 1984 and *Carpias* sp. This is the first record of *M. paucidens* in the Bahamas.

Mesanthura fasciata Kensley, 1982

Mesanthura fasciata Kensley and Schotte, 1989: 49, 51, figs. 18B, 20e–h. Markham et al., 1990: 413.

Material examined.—One female (2.1 mm), Station 145 Q4, 24°54′47.34″N, 77°53′16.48″W–24°54′47.80″N, 77°53′15.47″W, reef crest, 1.5 m, Andros Island, Bahamas, coll. P. M. Mikkelsen and G. Hendler, 29 Aug. 2000 (AMNH 18207).

Distribution.—Looe Key, Florida and Florida Middlegrounds; Gulf of Mexico (Kensley and Schotte, 1989); Quintana Roo, Mexico (Markham et al., 1990); Tobago (Kensley and Schotte, 1994); Bahamas (herein).

Remarks.—Co-occurring isopods were *Paranthura infundibulata* Richardson, 1902, *Carpias serricaudus* (Menzies and Glynn, 1968), and *Cirolana parva*. This is the first record for this species from the Bahamas.

Family Paranthuridae Menzies and Glynn, 1968

Paranthura infundibulata Richardson, 1902

Paranthura infundibulata Kensley and Schotte, 1989: 71, 73, figs. 32f–j. Markham et al., 1990: 413. Müller, 1990b: 189, 194, figs. 36–54.

Material examined.—One female (5.1 mm), Station 403R, 24°55′40.1″N, 77°54′25.6″W, reef crest, 5.5 m, Andros Island, Bahamas, coll. C. B. Boyko et al., 3 Sep. 2000 (AMNH 18208). One female (8.1 mm), Station 145 Q4, 24°54′47.34″N, 77°53′16.48″W–

24°54′47.80″N, 77°53′15.47″W, reef crest, 1.5 m, Andros Island, Bahamas, coll. P. M. Mikkelsen and G. Hendler, 29 Aug. 2000 (AMNH 18209).

Distribution.—Bermuda; Belize; Cozumel, Mexico; Venezuela (Kensley and Schotte, 1989); Quintana Roo, Mexico (Markham et al., 1990); Martinique (Müller, 1991); Tobago; Dominica; Colombia (Kensley and Schotte, 1994); Bahamas (herein).

Remarks.—Co-occurring isopods were *M. fasciata*, *C. serricaudus*, and *C. parva* (Station 145 Q4). This is the first record for this species from the Bahamas.

Suborder Asellota Latreille, 1803

Family Janiridae Sars, 1899

Carpias algicola (Miller, 1941)

Carpias algicola Kensley and Schotte, 1989: 83, figs. 38a,b. Markham et al., 1990: 415.

Material examined.—Seventy-nine specimens, (0.7–1.9 mm), Blue Hole, transect from 24°54′47.34″N, 77°53′16.48″W–24°54′47.80″N, 77°53′15.47″W, *Ceramium* algae over *Thalassia* seagrass, 1.2 m, Andros Island, Bahamas, coll. P. M. Mikkelsen and G. Hendler, 31 Aug. 2000 (AMNH 18210). Forty-four specimens, (0.7–2.1 mm), Blue Hole, 24°53′55.2″N, 77°55′12.1″W, *Ceramium* algae over sparse *Thalassia* seagrass, 1.2 m, Andros Island, Bahamas, coll. C. B. Boyko et al., 31 Aug. 2000 (AMNH 18211).

Distribution.—Looe Key, Florida; Yucatán, Mexico; Belize; Puerto Rico; Jamaica; Venezuela (Kensley and Schotte, 1989); Quintana Roo, Mexico (Markham et al., 1990); Tobago; Dominica (Kensley and Schotte, 1994); Bermuda (Kensley, 1984); Hawaii; India (Kensley and Schotte, 2002); Bahamas (herein).

Remarks.—Although only a single mature male was present in each of these two samples, we feel it is likely that all the specimens in each lot are this species in part based on the habitat from which they were collected. The propodus of the male in AMNH 18211 reaches only approximately three-fourths of the way down the carpus, but all other characters suggest that this is *C. algicola*. This is the first record for this species from the Bahamas, but the species may well have cosmopolitan distribution in the tropics and subtropics (Kensley and Schotte, 2002).

Carpias punctatus (Kensley, 1984)

Carpias punctatus Kensley and Schotte, 1989: 85, 86, figs. 38b,c.

Material examined.—One male (2.7 mm), in shell occupied by *Paguristes grayi* Benedict, Station 415R, 24°53′32.2″N, 77°53′51.4″W, thick *Thalassia* seagrass, 3.6 m, Andros Island, Bahamas, coll. C. B. Boyko et al., 4 Sep. 2000 (AMNH 18212).

Distribution.—Belize (Kensley and Schotte, 1989); Tobago; Dominica (Kensley and Schotte, 1994); Bahamas (herein).

Remarks.—Co-occurring isopods were *Asymmetrione desultor* Markham, 1975a, *Cancricepon choprae* (Nierstrasz and Brender à Brandis, 1925), *Parathelges*? *occidentalis* Markham, 1972b, *Cabirops* sp. A, *Cymodoce ruetzleri* Kensley, 1984, and *Paracerceis caudata* (Say, 1818). This is the first record for this species from the Bahamas.

Carpias serricaudus (Menzies and Glynn, 1968)

Carpias serricaudus Kensley and Schotte, 1989: 87, fig. 39d.
Bagatus serricauda Müller, 1993b: 434–439, figs. 1–25.

Material examined.—One male (1.9 mm), Station 145 Q4, 24°54′47.34″N, 77°53′16.48″W–24°54′47.80″N, 77°53′15.47″W, reef crest, 1.5 m, Andros Island, Bahamas, coll. P. M. Mikkelsen and G. Hendler, 29 Aug. 2000 (AMNH 18213).

Distribution.—Puerto Rico; Belize; Colombia (Müller, 1990a); Martinique (Müller, 1993b); Turks and Caicos (Kensley and Schotte, 1989); Tobago; Dominica (Kensley and Schotte, 1994); Bermuda (Kensley, 1984); Bahamas (herein).

Remarks.—Co-occurring isopods were *M. fasciata*, *P. infundibulata*, and *C. parva*. This is the first record for this species from the Bahamas.

Carpias sp. or spp.

Material examined.—One specimen (2.0 mm), Station 043R, 24°53′01.6″N, 77°52′50.5″W, fore reef, 11.5 m, Andros Island, Bahamas, coll. P. M. Mikkelsen et al., 1 Sep. 2000 (AMNH 18214). Two specimens (1.4–1.5 mm), Station 120 Q1, transect from 24°54′47.34″N, 77°53′16.48″W–24°54′47.80″N, 77°53′15.47″W, patch reef, 2.4 m at crest, Andros Island, Bahamas, coll. P. M. Mikkelsen and G. Hendler, 30 Aug. 2000 (AMNH 18215). Two specimens (1.0–1.9 mm), Blue Hole, transect from 24°54′47.34″N, 77°53′16.48″W–24°54′47.80″N, 77°53′15.47″W, *Ceramium* algae over *Thalassia* seagrass, 1.2 m, Andros Island, Bahamas, coll. P. M. Mikkelsen and G. Hendler, 31 Aug. 2000 (AMNH 18216).

Remarks.—As all of these lots lacked mature males, we were unable to identify them beyond the genus; however, we suspect that the specimens from the Blue Hole transect are *C. algicola*, as were two other samples collected from that locality. Co-occurring isopods included *M. bermudensis* and *M. menziesi* (Station 043R).

Family Joeropsidae Nordenstam, 1933

Joeropsis rathbunae Richardson, 1902

Joeropsis rathbunae Kensley and Schotte, 1989: 90, fig. 40i.

Material examined.—Two specimens (2.3–2.6 mm), Station 120 Q1, transect from 24°54′47.34″N, 77°53′16.48″W–24°54′47.80″N, 77°53′15.47″W, patch reef, 2.4 m at crest, Andros Island, Bahamas, coll. P. M. Mikkelsen and G. Hendler, 30 Aug. 2000 (AMNH 18217).

Distribution.—Bermuda; Florida Keys; Turks and Caicos; Puerto Rico; Gulf of Mexico (Kensley and Schotte, 1989); Colombia (Müller, 1989); Tobago (Kensley and Schotte, 1994); Bahamas (herein).

Remarks.—*Joeropsis rathbunae* is very similar to *J. coralicola* Schultz and McClosky, 1967, differing in the shape of the rostrum (convex in *J. rathbunae* and concave in *J. coralicola*) and the spination of the pleotelson, which is lacking in *J. coralicola*. Because the shape of the rostrum is somewhat variable in *J. rathbunae* (although never truly

concave), the pleotelson character is perhaps more reliable for the separation of these two species. Co-occurring isopods were *Carpias* sp., *Hansenium bowmani* (Kensley, 1984), and *P. caudata*. This is the first record of this species from the Bahamas.

Family Santiidae Wilson, 1987

Santia milleri (Menzies and Glynn, 1968)

Santia milleri Kensley and Schotte, 1989: 99, figs. 43f–h. Müller, 1993b: 456–459.

Material examined.—One specimen (0.9 mm), Station 144 Q1, transect from 24°54′43.80″N, 77°52′56.92″W–24°54′43.21″N, 77°52′57.97″W, fore reef, 11.8 m, Andros Island, Bahamas, coll. P. M. Mikkelsen and G. Hendler, 28 Aug. 2000 (AMNH 18218).

Distribution.—Belize; Puerto Rico; San Salvador, Bahamas; Turks and Caicos; Anguilla; Jamaica; Cozumel, Mexico; Gulf of Mexico (Kensley and Schotte, 1989); Bermuda (Kensley, 1994); Martinique (Müller, 1993b); Tobago; Dominica (Kensley and Schotte, 1994).

Remarks.—A co-occurring isopod was *C. parva*.

Family Stenetriidae Hansen, 1905

Hansenium bowmani (Kensley, 1984)

Stenetrium bowmani Kensley and Schotte, 1989: 100, 102, fig. 45.
Hansenium bowmani Serov and Wilson, 1995: 81.

Material examined.—One male (4.1 mm), Station 120 Q1, transect from 24°54′47.34″N, 77°53′16.48″W–24°54′47.80″N, 77°53′15.47″W, patch reef, 2.4 m at crest, Andros Island, Bahamas, coll. P. M. Mikkelsen and G. Hendler, 30 Aug. 2000 (AMNH 18219). One male (3.7 mm), Station 126R, 24°55′34.77″N, 77°54′15.31″W, *Thalassia* seagrass bed, Andros Island, Bahamas, coll. C. B. Boyko et al., 30 Aug. 2000 (AMNH 18220).

Distribution.—Cozumel, Mexico; Belize (Kensley and Schotte, 1989); Bahamas (herein).

Remarks.—Co-occurring isopods included *Carpias* sp., *J. rathbunae*, and *P. caudata* (Station 120 Q1); *Bopyrissa wolffi* Markham, 1978, and *P. occidentalis* (Station 126R). This is the first record for this species from the Bahamas.

Suborder Epicaridea Latreille, 1831

Family Bopyridae Rafinesque-Schmaltz, 1815

Subfamily Pseudioninae Codreanu, 1967

Asymmetrione desultor Markham, 1975a

Asymmetrione desultor Markham, 1975a: 255–259, figs. 1–4. Markham, 1978: 103. Bourdon, 1979: 143–144. Markham, 1988: 7–8. Markham, 2003: 73–74.

Material examined.—Sinistral female (6.7 mm), male (4.1 mm), infesting left branchial chamber of female *Pagurus brevidactylus* (Stimpson) (3.3 mm SL), Station 417R, 24°50′47.4″N, 77°53′16.3″W, sand/algal plain, 2.1 m, Andros Island, Bahamas, coll. C. B. Boyko et al., 6 Sep. 2000 (AMNH 18221). Sinistral female (2.7 mm) and male (1.7 mm) infesting left branchial chamber of female *P. brevidactylus* (2.3 mm SL); sinistral female (3.6 mm) and male (2.3 mm) infesting left branchial chamber of male *P. brevidactylus* (2.3 mm SL), Station 415R, 24°53′32.2″N, 77°53′51.4″W, thick *Thalassia* seagrass, 3.6 m, Andros Island, Bahamas, coll. C. B. Boyko et al., 4 Sep. 2000 (AMNH 18222).

Distribution.—North Carolina, on *Pagurus longicarpus* Say; Key Biscayne, Florida, on *P. stimpsoni* (A. Milne Edwards and Bouvier) (as *P. bonairensis* Schmitt); Antigua, on *P. provenzanoi* Forest and de St. Laurent; Cay Sal Bank, on *Pylopagurus* sp. (Markham, 1975a); Curaçao and Bonaire, on *P. provenzanoi* (Markham, 1978); Brazil, on *Paguristes tortugae* Schmitt (Bourdon, 1979); Colombia, on *P. brevidactylus*; Belize, on *Iridopagurus* sp. (Markham, 1988); Bahamas, on *P. brevidactylus* (herein).

Remarks.—The record from Colombia on the shrimp, *Periclimenes americanus* (Kingsley) (see Markham, 1988), was incorrect, and this parasite is known only from hermit crab hosts (McDermott, 1998). One hermit crab from Station 415R also had an immature *Parathelges* sp. attached to the abdomen (see under *P. occidentalis*). Co-occurring isopods were *C. punctatus*, *Cancricepon choprae*, *Cabirops* sp. A, *C. ruetzleri*, *P. caudata* (all Station 415R) and *Pseudione quasimodo* n. sp. (Station 417R). This is the first record of this species in the Bahamas.

Ecology.—A total of 84 *P. brevidactylus* was collected; three were found with *A. desultor* (3.6% prevalence). If all specimens of other possible hosts collected were included (one *Iridopagurus reticulatus* García-Gómez; one *Iridopagurus caribbensis* (A. Milne Edwards and Bouvier); four *Pagurus stimpsoni*; 21 *P. tortugae*), the prevalence drops to 2.7%.

Bopyrissa wolffi Markham, 1978

Bopyrissa wolffi Markham 1978: 103–107, figs. 1–5. Markham, 1979: 523–524. Markham et al., 1990: 416. Markham, 2003: 72.

Material examined.—Dextral female (2.1 mm) with male (0.9 mm) infesting right branchial chamber of female *Clibanarius tricolor* (Gibbes) (1.6 mm SL); cryptoniscid stage female (0.6 mm) infesting right branchial chamber of first crab stage *C. tricolor* (0.7 mm SL); dextral female (2.4 mm) with male (0.7 mm) infesting right branchial chamber of male *C. tricolor* (1.9 mm SL); dextral female (2.9 mm) with male (1.0 mm) infesting right branchial chamber of male *C. tricolor* (2.1 mm SL); dextral female (2.7 mm) with male (1.0 mm) infesting right branchial chamber of male *C. tricolor* (2.0 mm SL), Station 008R, 24°51′14.3″N, 77°52′50.7″W, *Thalassia* seagrass bed, 3.6 m, Andros Island, Bahamas, coll. C. B. Boyko et al., 6 Sep. 2000 (AMNH 18223). Dextral female (0.7 mm) with cryptoniscid male (0.6 mm) infesting right branchial chamber of female *C. tricolor* (1.05 mm SL); dextral female (2.3 mm) infesting right branchial chamber of female *C. tricolor* (1.8 mm SL); dextral female (2.6 mm) with male (0.7 mm) infesting right branchial chamber of female *C. tricolor* (1.9 mm SL); dextral female (1.5 mm) with male (0.7 mm) infesting right branchial chamber of female *C. tricolor* (1.4 mm

SL); dextral female (2.1 mm) with male (0.9 mm) infesting right branchial chamber of female *C. tricolor* (2.4 mm SL); dextral female (2.6 mm) with male (0.9 mm) infesting right branchial chamber of male *C. tricolor* (2.9 mm SL); Station 126R, 24°55′34.77″N, 77°54′15.31″W, *Thalassia* seagrass bed, Andros Island, Bahamas, coll. C. B. Boyko et al., 30 Aug. 2000 (AMNH 18224). Dextral female (1.3 mm) with male (0.6 mm) infesting right branchial chamber of male *C. tricolor* (1.1 mm SL); dextral female (1.6 mm) with male (0.7 mm) infesting right branchial chamber of female *C. tricolor* (1.4 mm SL); immature female (0.8 mm) with male (0.5 mm) infesting right branchial chamber of ? male *C. tricolor* (1.0 mm SL), seagrass, Station 126R, 24°55′34.77″N, 77°54′15.31″W, *Thalassia* seagrass bed, Andros Island, Bahamas, coll. C. B. Boyko et al., 3 Sep. 2000 (AMNH 18225).

Distribution.—Bermuda; Florida; Anderson Cay, Bahamas; Puerto Rico, all on *C. tricolor*; North Carolina and Texas, on *C. vittatus* (Bosc) (Markham, 1978); Quintana Roo, Mexico, on *C. tricolor* (Markham et al., 1990); Bahamas, on *C. tricolor* (herein).

Remarks.—Co-occurring isopods were *P. occidentalis* (Stations 126R and 008R), *Anathelges hyptius* (Station 008R), and *H. bowmani* (Station 126R).

Ecology.—A total of 122 *C. tricolor* was collected; 14 were found with *B. wolffi* (11.5% prevalence).

Pseudione quasimodo new species

(Figs. 2–5)

Material examined.—Holotype: dextral female (3.1 mm; AMNH 18226), infesting right branchial chamber of female *P. grayi* Benedict (2.8 mm SL). Allotype: male (1.8 mm; AMNH 18227), same data as holotype. Paratypes: dextral female (1.4 mm) with male (0.8 mm), infesting male *Paguristes invisisacculus* McLaughlin and Provenzano (1.1 mm SL), AMNH 18228. All specimens from Station 417R, 24°50′47.4″N, 77°53′16.3″W, sand/algal plain, 2.1 m, Andros Island, Bahamas, coll. C. B. Boyko et al., 6 Sep. 2000.

Type locality.—Andros Island, Bahamas, Atlantic Ocean.

Description.—Female (Figs. 2A,B), based on holotype. Body length 3.1 mm, maximal width 1.9 mm, head length 0.6 mm, head width 0.7 mm, pleon length 1.1 mm. Pereon weakly dextral. Body outline broadest at pereon, gradually narrowing at pleon, not markedly elongate (Fig. 2A). All body regions and pereonites distinctly segmented. No pigmentation apparent in holotype, but few small dark spots on pereonites 1–4 in paratype.

Head deeply immersed in first pereonite with broad anterior lamina raised and recurved along distal margin, lamina covered in minute scales. Eyes present, small relative to cephalon (although slightly larger on paratype), occurring near posterolateral corners of raised lamina edge. Antenna and antennule (Fig. 3A) each with three articles, all segments with fine scales, distal margins of segments with setae. Maxilliped (Figs. 3B,C) with elongate narrow spur; palp with six long thick setae (Fig. 3C), proximal lobe subquadrate, distal lobe subtriangular with rounded margins; posterior margin setose. First oostegite proximal lobe ovate, distal lobe subtriangular, internal ridge smooth (Fig. 3D).

Pereon composed of seven pereonites, broadest across pereonite 3, gradually tapering anteriorly and posteriorly. Coxal plates on sides of pereonites subequal, indistinctly separated from pereonites and covered in minute scales. Oostegites completely enclosing

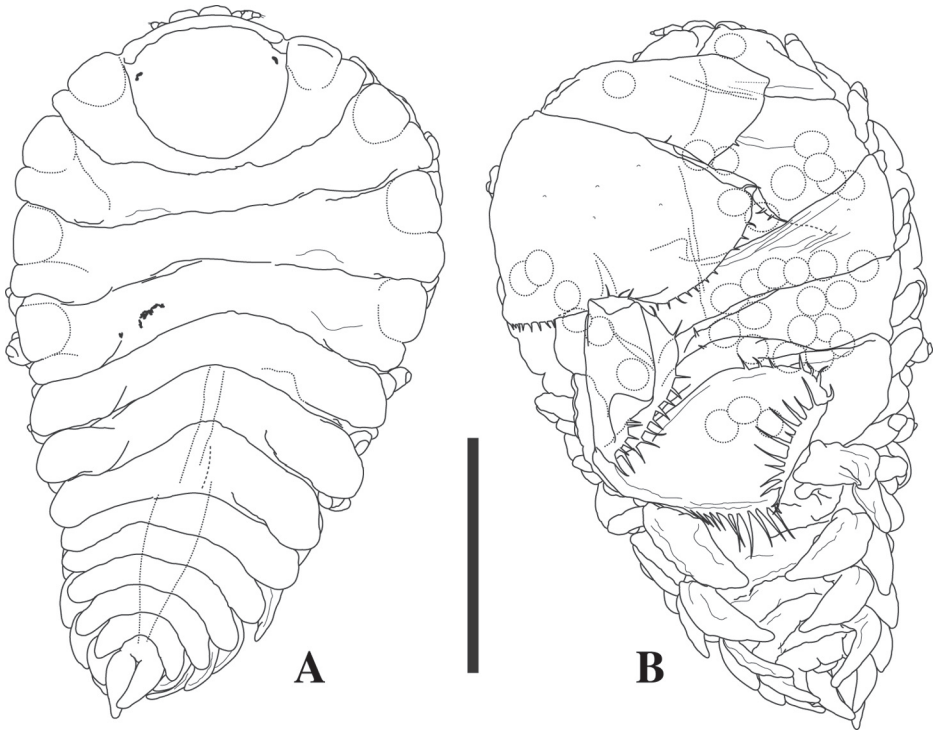

Figure 2. *Pseudione quasimodo* new species. Female, 3.1 mm, AMNH 18226, holotype. A, dorsal view; B, ventral view. Scale = 1 mm.

brood pouch and sparsely covered in minute tubercles; posteriormost oostegite with long fringe of setae on posterior margin. Pereopods 3–6 of about same size; pereopods 1, 2, and 7 (Figs. 3E,F) slightly smaller and shorter. Surfaces of all segments of all pereopods with numerous minute scales; short setae at distoventral tips of propodus and carpus. First pereopods surrounding head region; no large gaps between any pereopods.

Pleon with five distinct pleonites plus pleotelson. Pleonites with extended lanceolate, distally subacute, biramous pleopods and uniramous short rounded lateral plates (Fig. 2B); lateral plates and pleopods reduced in size from anterior to posterior; pleotelson (Fig. 2A) simple, notched medially, with pair of large broad lanceolate, distally subacute, uniramous uropods. Lateral plates, pleopods and uropods covered with minute scales.

Male (Figs. 4,5), based on allotype. Length 1.8 mm, maximal width 0.6 mm, head length 0.2 mm, head width 0.3 mm, pleon length 0.7 mm.

Head suboval, widest posteriorly, distinct from first segment of pereon (Fig. 4A; partly fused in paratype). Small eyes (relative to cephalon) near posterolateral margin. Antenna of five articles, distally setose; extending posterolaterally from head; antennule of three articles; antennae and antennule with scattered small scales bearing setae on proximal segments (Fig. 5A).

Pereonites 3–5 broadest, tapering anteriorly and posteriorly. All pereonites directed laterally, distolateral margins rounded. Irregular dark pigmentation pattern on posterior third of cephalon and anterior half of pereonite 1 (more extensive on paratype; dispersed over cephalon, pereonites 1–7 and pleonite 8). Pereopods (Figs. 5B,C) 2–4 subequal, 1, 6, and 7 smaller and subequal, all articles distinctly separated, few scales distoventral margin of propodus and ventral surface of carpal projection.

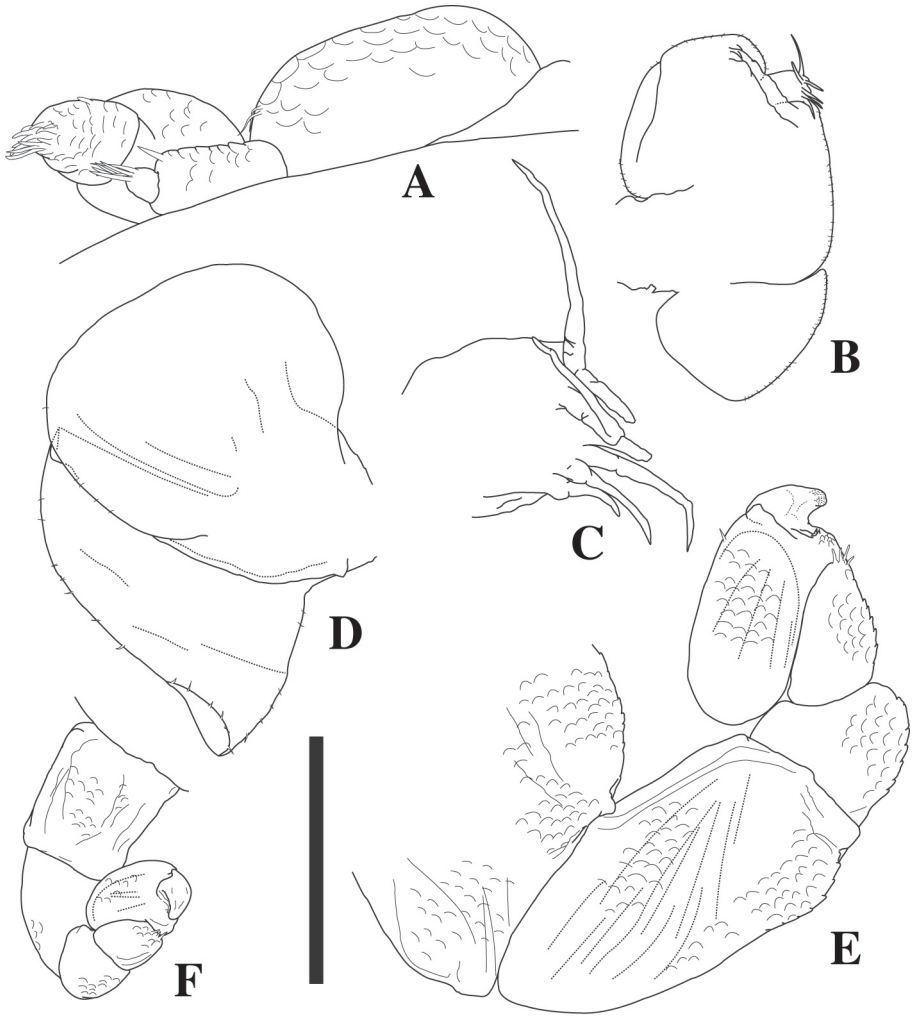

Figure 3. *Pseudione quasimodo* new species. Female, 3.1 mm, AMNH 18226, holotype. A, right antenna and antennule; B, left maxilliped, external; C, palp of left maxilliped; D, right oostegite 1, internal; E, right pereopod 1; F, left pereopod 7, external. Scale = 162.5 μm (C), 200 μm (A), 305 μm (E, F), 400 μm (B), and 500 μm (D).

Pleon with five segments plus pleotelson; segments tapering posteriorly, pleonites directed laterally, posterior margins straight, distolateral tips with low tubercles and tuft of setae. All pleonites distinctly segmented, moderately produced laterally, not markedly narrower than pereonites but more angular at distolateral margins than pereonites. No midventral tubercles; five pairs of tuberculiform pleopods with faintly crenulate surface, each pleopod with mesial indentation proximate to small semicircular patch of acute spinules (Fig. 5D; paratype with only faint trace of mesial indentation and no visible spinules). Pleotelson (Figs. 4A,5D) notched medially with minute anal cone, produced distolaterally into rounded lobes (fused lateral plates), dorsal and ventral surfaces of lobes with scattered tubercles, distal margins of lobes with patch of setae; uropods absent.

Distribution.—Known only from Andros Island, Bahamas, on *P. grayi* and *P. invisisacculus*.

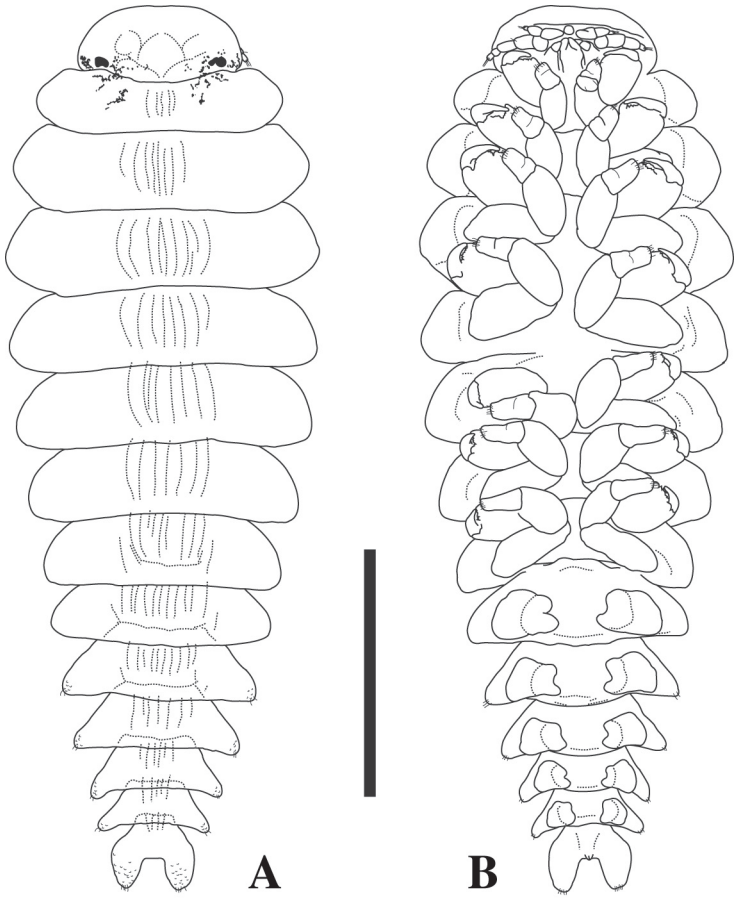

Figure 4. *Pseudione quasimodo* new species. Male, 1.8 mm, AMNH 18227, allotype. A, dorsal view; B, ventral view. Scale = 500 μm.

Etymology.—The specific name quasimodo is derived from Victor Hugo's famous bell-ringer of Notre Dame, most famously portrayed in film by the great Lon Chaney (1883–1930). This appellation is appropriate due to the shape of the female isopod and the bulge it creates in the branchial chamber of the host. It is given as a noun in apposition.

Remarks.—There are two main forms of male telson in the hermit crab parasite group of *Pseudione* (see appendix 1 for species list with authorship): diamond-shaped with a produced distomedial region (*Pseudione hyndmanni*, *Pseudione intermedia*, and *Pseudione nobilii*) and v-shaped with an indented distomedial region (*Pseudione biacuta*, *Pseudione giardi*, and *Pseudione novaeguineensis*). The telson of *Pseudione clibanaricola* is indented at the distomedial margin, possesses a small but obvious medial projection (anal cone) within that space (Shiino, 1933), and is more like the *biacuta*-group than the *hyndmanni*-group in this regard. Unfortunately, the males of *Pseudione calcinii* and *Pseudione brandaoi* are unknown. With the exception of *P. novaeguineensis* (Danforth, 1971), the males of all previously described species have low rounded pleopods. Examination of the allotype and paratype males of *P. novaeguineensis* (LACM CR 19691223 and CR 19691224), confirm that the males of this species have swellings near the loca-

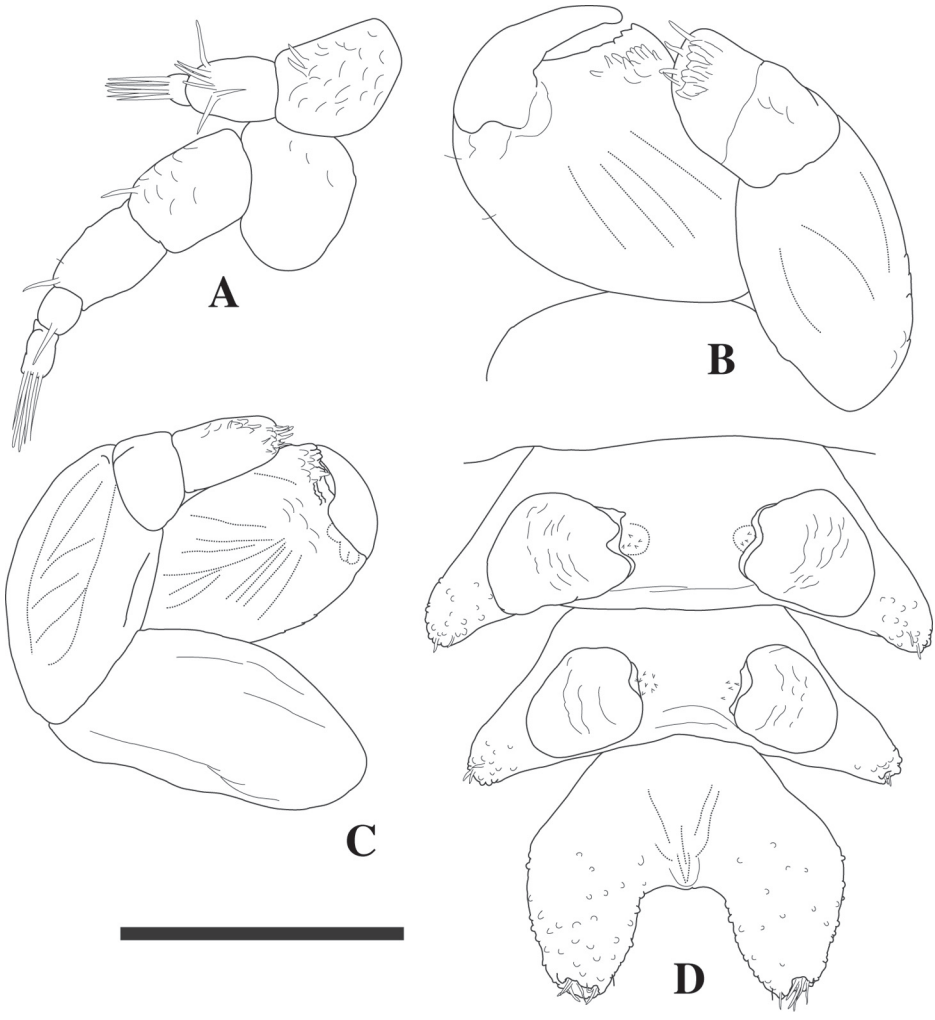

Figure 5. *Pseudione quasimodo* new species. Male, 1.8 mm, AMNH 18227, allotype. A, left antenna and antennule; B, left pereopod 1; C, left pereopod 7; D, pleomeres 4, 5, and pleotelson. Scale = 200 μm (A, B), 300 μm (C, D).

tion where pleopods would occur, but without any obvious pleopod development. The males of *P. quasimodo* n. sp. have a telson shape that places them in the *biacuta*-group given above, and also possess rounded pleopods on the pleonites, although these pleopods are mesially indented.

The females of the hermit crab-infesting *Pseudione* species show a large amount of variability in the width of uropods, which can be extremely narrow (e.g., *P. calcinii*) or quite broad (e.g., *P. biacuta*). The overall shape of the body, however, appears to fall into two groups: those with nearly straight anteroposterior alignment (all species except *P. calcinii*, *P. clibanaricola*, and *P. novaeguineensis*) and a faint-to-pronounced S-shaped curvature (the three aforementioned species, with *P. clibanaricola* and *P. novaeguineensis* showing the strongest deviation from a straight line). *Pseudione quasimodo* has a slight curve to the body but is not S-shaped.

The shape of the female pleotelson in all of the nine previously described species of *Pseudione* found on hermit crabs is unremarkable, typically being a small rounded or slightly pointed lobe. This is also true in *P. quasimodo.*

Pseudione quasimodo most closely resembles *P. biacuta* Bourdon, 1979, known only from Uruguay on the congeneric host *Paguristes robustus* Forest and de Saint-Laurent. The female *P. quasimodo* differs from *P. biacuta* in having less pronounced gaps between the coxal plates and the pereonites, a much less immersed pleotelson within pleonite 5, and much larger uropods, as well as a very differently shaped first oostegite. Males of *P. quasimodo* differ from *P. biacuta* in having the posterior margins of pleonites 3–5 straight instead of sharply concave, and in having broader, more separated projections on the pleotelson. It is unknown if *P. deflexa* possesses similar tubercles and setae on the pleonites and pleotelson of the male.

Presumably, the degree of head fusion with the first pereonite and the dispersal pattern of pigmentation in the male *P. quasimodo* are the result of individual variation, but the differences in the shape of the pleopods and development of the related mesial spinules between the paratype and allotype may be due to differences in the stage of development of each specimen. However, more specimens are required before any conclusions are drawn on these variable characters.

A co-occurring isopod was *A. desultor* (Station 417R).

Ecology.—A total of 36 *P. grayi* was collected; one was found with *P. quasimodo* (2.7% prevalence). Thirteen *P. invisisacculus* were collected; one was found with *P. quasimodo* (7.7% prevalence). If all specimens of both known hosts are combined, the prevalence is 4.1%. This is the first report of a bopyrid isopod on either *P. grayi* or *P. invisisacculus*.

Pseudionella deflexa Bourdon, 1979

Pseudionella deflexa Bourdon, 1979: 139–141, fig. 1. Boyko and Williams, 2001: 652. Markham, 2003: 74

Material examined.—Sinistral female (2.5 mm, with one female and three male *Cabirops* cryptoniscid isopods in the brood chamber), infesting left branchial chamber of male *P. brevidactylus* (2.1 mm SL), Station 409R, 24°53′13.3″N, 77°54′47.2″W, sand/algal plain, 1.2–1.8 m, Andros Island, Bahamas, coll. C. B. Boyko et al., 1 Sep. 2000 (AMNH 18204).

Distribution.—Brazil, on *Pagurus criniticornis* (Dana) (Bourdon, 1979); Bahamas, on *P. brevidactylus* (Boyko and Williams, 2001; herein).

Remarks.—This specimen was previously reported by Boyko and Williams (2001) in their review of the genus *Pseudionella* Shiino, 1949, and represented a new host record and a significant range extension for the species, which was previously known only from Brazil.

Ecology.—A total of 84 *P. brevidactylus* was collected; one was found with *P. deflexa* (1.2% prevalence).

Subfamily Ioninae H. Milne Edwards, 1840

Cancricepon choprae (Nierstrasz and Brender à Brandis, 1925)

Grapsicepon choprae Nierstrasz and Brender à Brandis, 1925: 4, figs. 11–16.
Cancricepon choprae Markham, 1979: 524.

Material examined.—Sinistral female (2.1 mm, with one female and one male *Cabirops* cryptoniscid isopod in the brood chamber) with male (0.8 mm), infesting right branchial chamber of male *Panopeus boekei* Rathbun (3.9 mm CL; AMNH 18229), Station 415R, 24°53′32.2″N, 77°53′51.4″W, thick *Thalassia* seagrass, 3.6 m, Andros Island, Bahamas, coll. C. B. Boyko et al., 4 Sep. 2000 (AMNH 18230). Immature female (2.0 mm), infesting right branchial chamber of female *P. boekei* (4.6 mm CL; AMNH 18231), Blue Hole, transect from 24°54′47.34″N, 77°53′16.48″W–24°54′47.80″N, 77°53′15.47″W, *Thalassia* seagrass bed, 1.2 m, Andros Island, Bahamas, coll. P. M. Mikkelsen and G. Hendler, 31 Aug. 2000 (AMNH 18232).

Distribution.—North Carolina to Florida and Mississippi; Vera Cruz, Mexico; Curaçao, on numerous xanthid host species (including *Rhithropanopeus harrisii* (Gould), *Dyspanopeus sayi* (Smith), *Panopeus herbstii* H. Milne Edwards, *Hexapanopeus angustifrons* (Benedict and Rathbun), *Domecia acanthophora* (Desbonne and Schramm), *Paraliomera dispar* Stimpson, *Panoplax depressa* Stimpson, and ? *Eriphia gonagra* (Fabricius) (Markham, 1979); ? Bermuda, on *P. herbstii* (Markham, 1979); Bahamas, on *Panopeus boekei* (herein).

Remarks.—Co-occurring isopods at Station 415R included *C. punctatus*, *A. desultor*, *P.* ? *occidentalis*, *Cabirops* sp. A, *C. ruetzleri*, and *P. caudata*. This is the first record of this species from the Bahamas, and a new host species for the parasite.

Ecology.—A total of ten *P. boekei* was collected; two were found with *C. choprae* (20% prevalence). If all specimens of other possible hosts collected are included (two *H. angustifrons*; one *P. dispar*), the prevalence drops to 15.4%.

Subfamily Bopyrinae Rafinesque, 1815

Ovobopyrus alphezemiotes Markham, 1985

Ovobopyrus alphezemiotes Markham, 1985: 63–65, figs 27,28.

Material examined.—Dextral female (2.1 mm) with juvenile male (0.5 mm), infesting right branchial chamber of female *Alpheus armillatus* H. Milne Edwards (3.0 mm CL; AMNH 18233), Station 409 Q3, transect from 24°54′47.34″N, 77°53′16.48″W–24°54′47.80″N, 77°53′15.47″W, sand/algal plain, 1.2–1.8 m, Andros Island, Bahamas, coll. P. M. Mikkelsen and G. Hendler, 1 Sep. 2000 (AMNH 18234).

Distribution.—off Tampa Bay, Florida, on *A. armillatus* (Markham, 1985); Bahamas, on *A. armillatus* (herein).

Remarks.—This is the first record of this species from the Bahamas, and only the second record overall but not a new host.

Ecology.—Two *A. armillatus* were collected; one was found with *O. alphezemiotes.*

Parabopyrella richardsonae (Nierstrasz and Brender à Brandis, 1929)

Bopyrella richardsonae Nierstrasz and Brender à Brandis, 1929: 33, 34, figs. 41,42.
Parabopyrella richardsonae Markham, 1985: 78–80, fig. 36.

Material examined.—Faintly sinistral female (4.9 mm) with two cryptoniscid males (1.0 mm), infesting left branchial chamber of male *Alpheus viridari* Armstrong (7.2 mm CL; AMNH 18235), intertidal zone, Forfar Field Station, Andros Island, Bahamas, coll. C. B. Boyko et al., 29 Aug. 2000 (AMNH 18236).

Distribution.—U.S. Virgin Islands, on *Alpheus formosus* Gibbes; Boca Ciega Bay, Florida, on *A. heterochaelis* (Say); off Tampa Bay, Florida, on *A. formosus* (Markham, 1985); Bahamas, on *A. viridari* (herein).

Remarks.—This is the first record of this species from the Bahamas, and a new host record for the parasite.

Ecology.—A single *A. viridari* specimen was collected; it was parasitized by *P. richardsonae*.

Subfamily Athelginae Codreanu and Codreanu, 1956

Parathelges occidentalis Markham, 1972

Parathelges occidentalis Markham, 1972b: 60–66, figs. 1–9. Markham et al., 1990: 416. Markham, 2003: 72–73, 75.

Material examined.—Sinistral female (3.9 mm) with male (2.0 mm), infesting female *Clibanarius tricolor* (2.0 mm SL); immature female (3.0 mm) with two cryptoniscid males (1.3–1.3 mm), infesting female *C. tricolor* (2.2 mm SL), Station 008R, 24°51′14.3″N, 77°52′50.7″W, *Thalassia* seagrass bed, 3.6 m, Andros Island, Bahamas, coll. C. B. Boyko et al., 6 Sep. 2000 (AMNH 18237). Sinistral female (2.7 mm) with damaged male (approx. 1.3 mm), infesting male *C. tricolor* (1.6 mm SL), Station 126R, 24°55′34.77″N, 77°54′15.31″W, *Thalassia* seagrass bed, Andros Island, Bahamas, coll. C. B. Boyko et al., 30 Aug. 2000 (AMNH 18238). Immature female (2.0 mm) with male (1.1 mm), infesting male *C. tricolor* (1.7 mm SL), Station 126R, 24°55′34.77″N, 77°54′15.31″W, *Thalassia* seagrass bed, Andros Island, Bahamas, coll. C. B. Boyko et al., 3 Sep. 2000 (AMNH 18239). Immature female (2.3 mm; identity questionable), infesting male *P. brevidactylus* (1.7 mm SL, infested branchially with *A. desultor*), Station 415R, 24°53′32.2″N, 77°53′51.4″W, *Thalassia* seagrass bed, 3.6 m, Andros Island, Bahamas, coll. C. B. Boyko et al., 4 Sep. 2000 (AMNH 18240).

Distribution.—Dry Tortugas and Key West, Florida; Bahamas, all on *C. tricolor*; Venezuela, on *Iridopagurus margaritensis* Garcia-Gomez. (Markham, 1972b); North Carolina, *Manucomplanus ungulatus* (Studer) (as *Pylopagurus corallinus* (Benedict)) (Markham, 1978); Quintana Roo, Mexico, on *C. tricolor* (Markham et al., 1990).

Remarks.—The identity of the specimen found on the abdomen of the *Pagurus brevidactylus* from Station 415R is uncertain. This female is very immature, but closely resembles the other immature specimens collected from *C. tricolor* and may therefore be true *P. occidentalis*. However, the only *Parathelges* known from *P. brevidactylus* are *P. piriformis* Markham, 1972, and *P. foliatus* Markham, 1972 (Markham, 1972b; 1979; 1988). All of these species are difficult to separate when mature material is examined and it is nearly impossible to distinguish juveniles. Either *P. brevidactylus* is a new host

for *P. occidentalis*, or this specimen is an immature *P. piriformis* or *P. foliatus*. It may also be possible that one or more of the western Atlantic *Parathelges* spp. are synonymous, but this cannot be addressed until a review of the genus is completed (Williams and Boyko, in prep.). Co-occurring isopods with reliably identified *P. occidentalis* were *B. wolffi* (Stations 126R and 008R), *A. hyptius* (Station 008), and *H. bowmani* (Station 126R). Co-occurring isopods with the questionable *P. occidentalis* at Station 415R included *C. punctatus*, *A. desultor* (on same host specimen as the *Parathelges*), *C. choprae*, *Cabirops* sp. A, *C. ruetzleri*, and *P. caudata*.

Ecology.—A total of 122 *C. tricolor* was collected; four were found with reliably identified *P. occidentalis* (3.3% prevalence).

Anathelges hyptius (Thompson, 1902)

Stegophryxus hyptius Markham, 1974: 33–35, 38, 40, figs. 1–3. Markham, 1978: 111. Markham, 1988: 45–46; Markham, 2003: 73–74.
Anathelges hyptius Boyko and Williams, 2003: 798–800, figs. 2,3.

Material examined.—Dextral female (2.4 mm) with cryptoniscid male (1.1 mm), infesting female *P. brevidactylus* (Stimpson) (1.3 mm SL), Station 008R, 24°51′14.3″N, 77°52′50.7″W, *Thalassia* seagrass bed, 3.6 m, Andros Island, Bahamas, coll. C. B. Boyko et al., 6 Sep. 2000 (AMNH 18241).

Distribution.—Massachusetts; Rhode Island; Georgia, all on *P. longicarpus* Say; North Carolina, on *P. annulipes* (Stimpson); Florida, on *P. brevidactylus* and *Pagurus stimpsoni* (as *P. bonairensis* Schmitt) (Markham, 1974); Curaçao, on *P. provenzanoi* Forest and de St. Laurent and *I. margaritensis* García-Gómez (Markham, 1978; 1988); Sanibel, Florida, on *I. caribbensis* (A. Milne Edwards and Bouvier); Miami, Florida, on *Pagurus maclaughlinae* García-Gómez (Markham, 1988); Bahamas, on *P. brevidactylus* (herein).

Remarks.—Co-occurring isopods were *B. wolffi* and *P. occidentalis*. This is the first record of this species from the Bahamas. For a complete history of the generic placement of this species, see Boyko and Williams (2003).

Ecology.—A total of 84 *P. brevidactylus* was collected; one was found with *A. hyptius* (1.2% prevalence). If all specimens of other possible hosts collected are included (four *P. stimpsoni*; one *I. caribbensis*; three *P. maclaughlinae*), the prevalence drops to 1.1%.

Subfamily Hemiarthrinae Markham, 1972a

Hemiarthrus surculus new species

(Figs. 6,7)

Material examined.—Dextral female (2.8 mm), infesting ventral abdomen of male *Alpheus simus* Guérin-Méneville (3.9 mm CL), Station 145 Q1, transect from 24°54′47.34″N, 77°53′16.48″W–24°54′47.80″N, 77°53′15.47″W, reef crest, 1.5 m, Andros Island, Bahamas, coll. P. M. Mikkelsen and G. Hendler, 29 Aug. 2000 (AMNH 18242).

Distribution.—Bahamas, on *Alpheus simus* (herein).

Type locality.—Andros Island, Bahamas, Atlantic Ocean.

Description.—Female (Figs. 6,7). Body length 2.8 mm, maximal width 2.7 mm, head

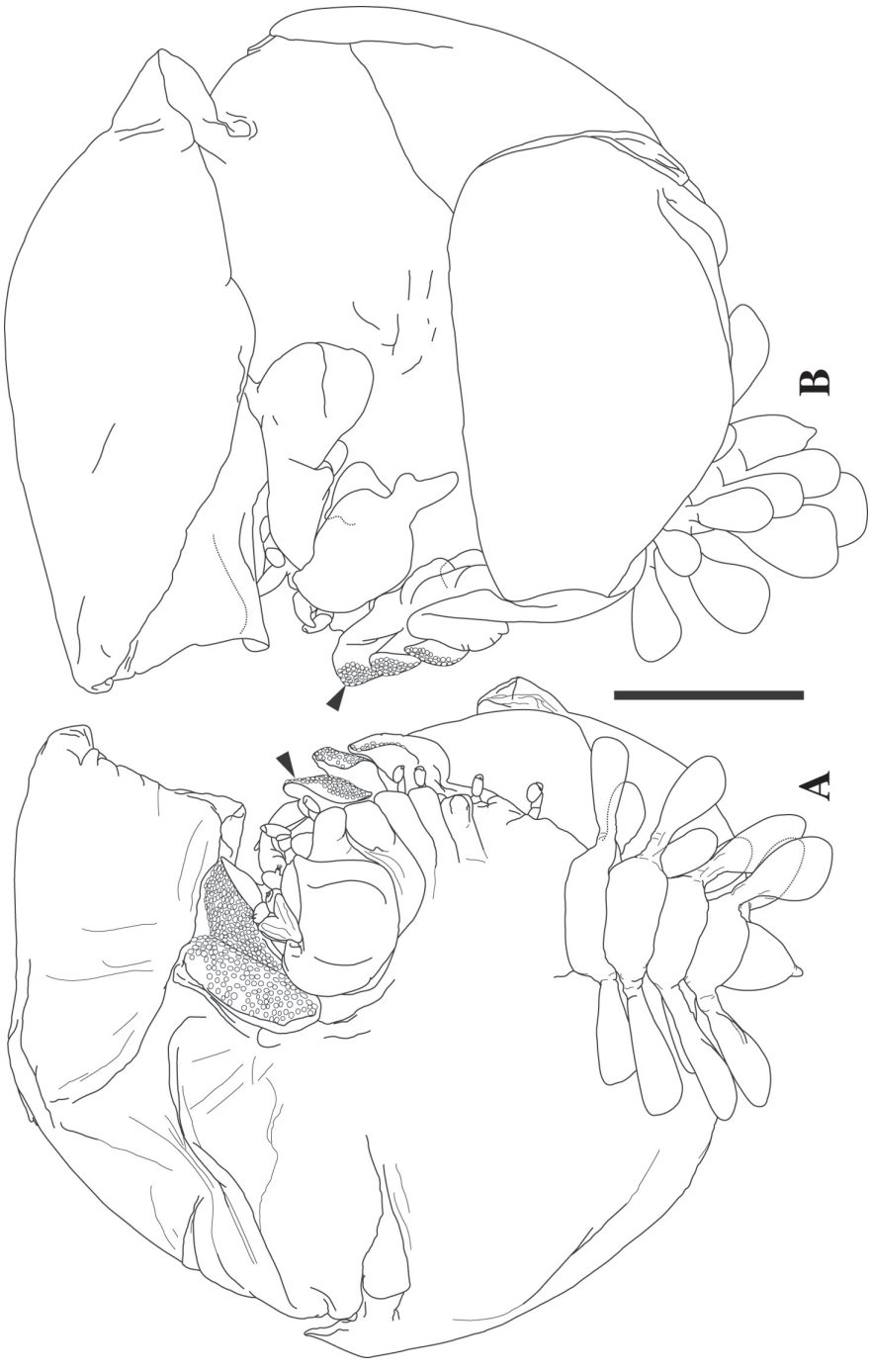

Figure 6. *Hemiarthrus surculus* new species. Female, 2.8 mm, AMNH 18242, holotype. A, dorsal view; B, ventral view. Scale = 1 mm.

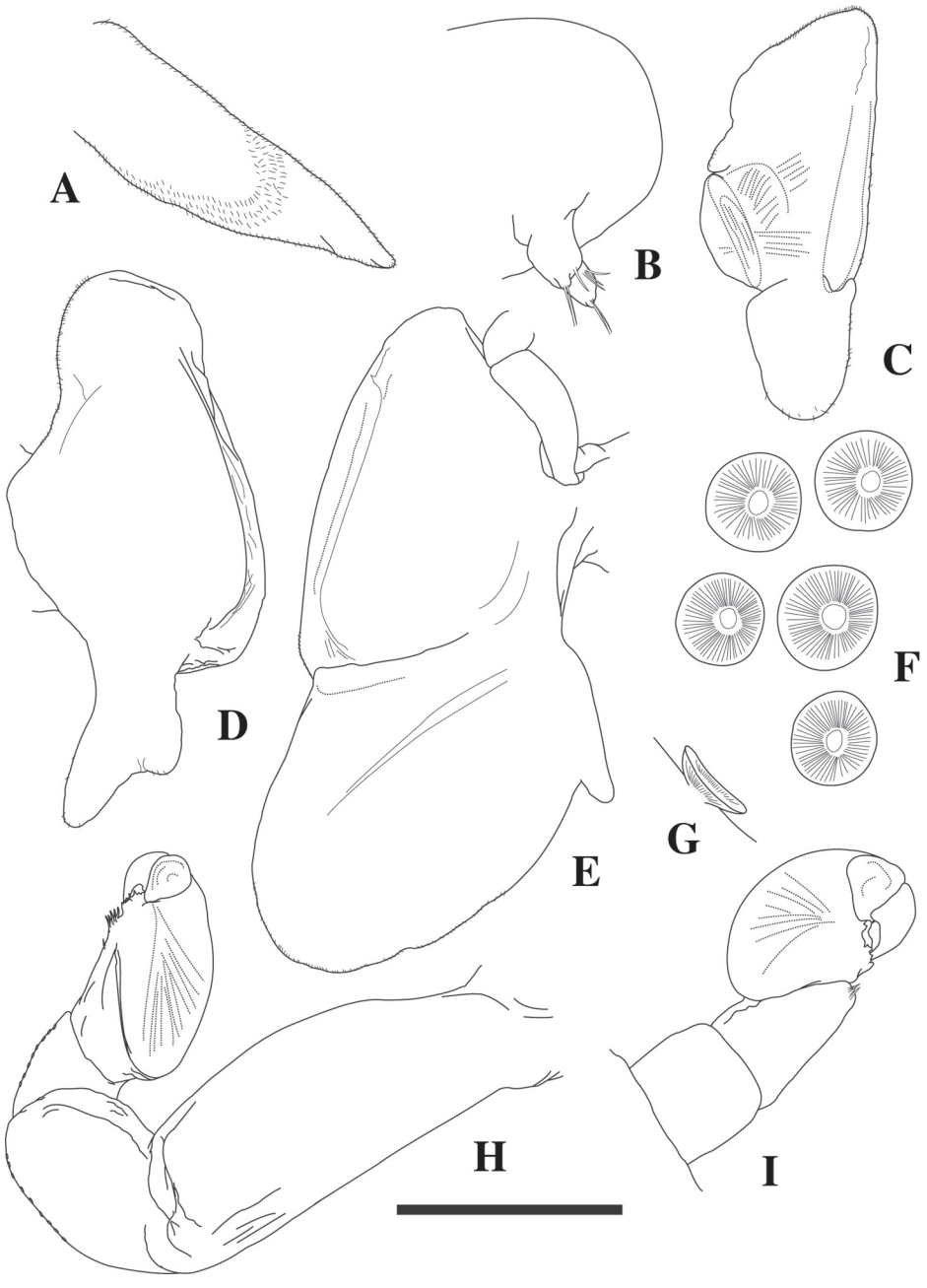

Figure 7. *Hemiarthrus surculus* new species. Female, 2.8 mm, AMNH 18242, holotype. A, antennule; B, antenna; C, right maxilliped, external; D, right oostegite 1, external; E, left oostegite 1, external; F, cup-like scales of oostegites, overview; G, cup-like scale, lateral view; H, left pereopod 1; I, left pereopod 7. Scale = 120 μm (F, G), 155 μm (I), 200 μm (B), 255 μm (A), 305 μm (H), and 500 μm (C–E).

length 0.4 mm, head width 0.3 mm, pleon length 1.4 mm. Pereon dextral. Body outline broadest at pereon, gradually narrowing at pleon, not markedly elongate (Fig. 6). First two pereonites distinctly segmented, pereonites 3–5 segmented only at lateral margin at insertion of pereopods, pereonites 6 and 7 with only minimal segmentation at lateral margin. No dark pigmentation pattern observed in life.

Head large, overlapping first and part of second pereonites. Eyes absent. Deep v-shaped groove in dorsodistal surface of cephalon containing unsegmented antennule; antenna with three segments, distally setose, large basal segment (Figs. 7A,B). Maxilliped (Fig. 7C) without spur; palp lacking; anterior lobe elongate and subtriangular, posterior lobe irregularly ovate with lateral projection. Oostegite 1 dimorphic: right first oostegite proximal lobe oblong with irregular margins, distal lobe bilobed with one long slender distally rounded projection and one short rounded projection, internal ridge smooth (Fig. 7D); left oostegite 1 proximal lobe similar to right oostegite 1, distal lobe broadly ovate with small lateral projection (Fig. 7E). Second oostegite reflexed over lateral margins of cephalon, external surface covered with minute, dorsally concave, cup-shaped discs (Figs. 6, 7F,G); cup-shaped discs also on lateral margins of oostegites 3 and 4 (Fig. 6).

Pereon composed of seven pereonites, all at least partly fused on right margin, broadest in region of pereonites 3 and 4, gradually tapering anteriorly and posteriorly. Coxal plates lacking. Oostegites completely enclosing brood pouch; posteriormost oostegite smooth, without setae on posterior margin. Pereopods 1–7 on convex side gradually smaller towards posterior (Figs. 7H, I); concave side with pereopod 1 reflexed over cephalon, pereopods 2–7 lacking. Surfaces of pereopods with minute scales; short setae at distoventral tips of propodus and carpus. First pereopods surrounding head region; no large gaps between any pereopods.

Pleon with five pleonites plus pleotelson. Pleonites 1–4 with extended narrow, distally rounded, uniramous pleopods on short peduncles and identically shaped, uniramous lateral plates (Figs. 6A,B); lateral plates and pleopods all subequal; pleotelson (Figs. 6A,B) simple; lateral margins convex and tapering to mucronate produced tip; uropods absent.

Male unknown.

Distribution.—Known only from Andros Island, Bahamas, on *A. simus*.

Etymology.—The specific name *surculus* is derived from the Latin word meaning "sucker," in reference to the numerous cup-shaped discs on the surface of oostegites 2–4, which we suspect have an attachment function.

Remarks.—Of the two species properly placed in *Hemiarthrus* (see Markham, 1985), this new species most closely resembles *Hemiarthrus synalphei* (Pearse, 1950), especially in the shape of the pleotelson which is simple in *H. synalphei* but bifurcated in *Hemiarthrus abdominalis* (Krøyer, 1840–1841). However, the shape of the uniramous pleopods and lateral plates are much more reduced and symmetrical than in the other species, both from side to side and pleonite to pleonite. Also, the shape of the pleotelson and first oostegite are distinct from both previously described species. The most striking feature of the new species is perhaps the extreme fusion of the pereonites and pleonites with the soma. In *H. synalphei*, the pereonites but not the pleonites are fused on the convex side, and in *H. abdominalis* even fewer pereonites are fused. In the new species, pereonites 3–7 and pleonite 1 are at least partly fused with the soma, with pereonites 6 and 7 showing no segmentation except at the extreme junction with their pereopods. This new species is only the third known *Hemiarthrus*. Both the host and parasite were a bright lemon yellow in color.

All three species of *Hemiarthrus* possess similar cup-shaped structures on the surface of oostegite 2 near the cephalon which do not appear to have been described previously. Under high magnification, these structures on *H. surculus* n. sp. and *H. abdominalis* (from *Pandalus borealis* Krøyer, Gulf of Maine; AMNH 5193) appear as cup-shaped discs, which we hypothesize may aid in attachment of the parasite to its host. The presence of these attachment structures is evident in previously published illustrations of *H. synalphei* (e.g., Markham, 1985: figs. 55,56), although the cup-shaped morphology was not noted rather they were identified as tubercles.

The hosts for *Hemiarthrus surculus* and *H. synalphei* are both alpheid shrimp occurring in warm waters, while *H. abdominalis* is circumboreal and infests pandalid and hippolytid shrimp. It is unfortunate that no male was obtained with the holotype of the new species; however, its affinities are clear based on the female specimen alone. The host of the new species is sometimes cited in the literature as *Thunor simus*, as the validity of *Thunor* as a separate genus has been debated (e.g., Chace, 1972).

Ecology.—Six *A. simus* were collected; one was found with *H. surculus* (16.7% prevalence). This is the first report of a bopyrid parasite on *A. simus.*

Family Cabiropidae Giard and Bonnier, 1887

Cabirops sp. A

Material examined.—One female (1.1 mm) with two males (1.1 mm) infesting female *Cancricepon choprae* (2.1 mm; AMNH 18230) infesting right branchial chamber of male *P. boekei* Rathbun (3.9 mm CL; AMNH 18229), Station 415R, 24°53′32.2″N, 77°53′51.4″W, thick *Thalassia* seagrass, 3.6 m, Andros Island, Bahamas, coll. C. B. Boyko et al., 4 Sep. 2000 (AMNH 18243).

Distribution.—Known only from Andros Island, Bahamas, on *C. choprae* parasitizing *P. boekei.*

Remarks.—Preliminary examination of this hyperparasite shows it to be distinct from all previously known species, as well as those that are known but not described (Sassaman, 1985: 786). This includes the only two described species from the western Atlantic, *C. pseudioni* Lemos de Castro, 1970, and *P. lobiformis* Lemos de Castro, 1970, as well as the undescribed *Cabirops* sp. illustrated by Markham (1979). Cryptoniscus larvae of *Cabirops* sp. A possess bifid dactyli on pereopods 1 and 2, a strong internal apophysis on article 2 of antenna 2, and a coxal plate dentition formula of 1:3, 2:1, 3:1, 4:1, 5:1, 6:1, 7:1 (unique among known *Cabirops* species). Sassaman (1985) noted that all *Cabirops* spp. with multiple denticles on all coxal plates were parasites on the bopyrid family Ioninae, but *Cabirops* sp. A deviates from that pattern. No other cabiropid species are known from *C. choprae.* Unfortunately, the female is too damaged to even allow illustration. Co-occurring isopods, other than the host species, were *C. punctatus*, *A. desultor*, *P.* ? *occidentalis*, *C. ruetzleri*, and *P. caudata.*

Cabirops sp. B

(Fig. 8)

Material examined.—One female (2.6 mm) with three male (1.2–1.3 mm) infesting female *Pseudionella deflexa* Bourdon (2.5 mm; AMNH 18204) infesting left bran-

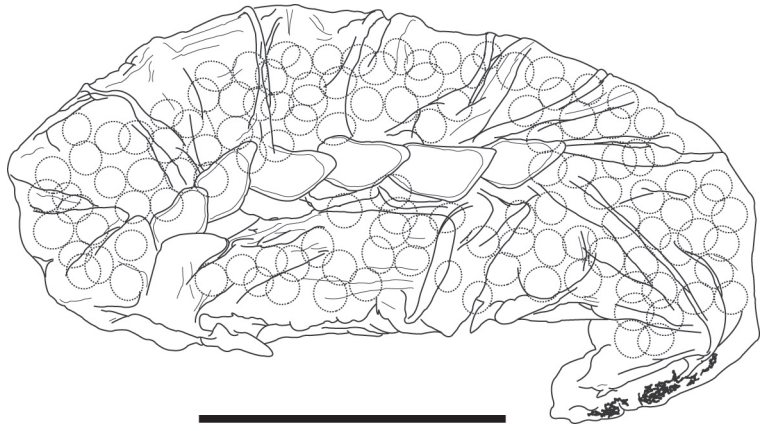

Figure 8. *Cabirops* sp. B. Female, 2.6 mm, AMNH 18244. Lateral view; anterior end on right. Scale = 1 mm.

chial chamber of male *Pagurus brevidactylus* (Stimpson) (2.1 mm CL), Station 409R, 24°53′13.3″N, 77°54′47.2″W, sand/algal plain, 1.2–1.8 m, Andros Island, Bahamas, coll. C. B. Boyko et al., 1 Sep. 2000 (AMNH 18244).

Distribution.—Known only from Andros Island, Bahamas, on *P. deflexa* parasitizing *P. brevidactylus.*

Remarks.—Like the above-cited *Cabirops* sp. A, this species appears distinct from all previously known species, as well as those that are known but undescribed (Sassaman, 1985: 786). This includes the two from the western Atlantic described by Lemos de Castro (1970) and the undescribed species illustrated by Markham (1979). Cryptoniscus larvae of *Cabirops* sp. B possess bifid dactyli on pereopods 1 and 2, a strong internal apophysis on article 2 of antenna 2, and a coxal plate dentition formula of 1:3, 2:3, 3:1, 4:1, 5:1, 6:1, 7:1 (unique among known *Cabirops* species). No other cabiropid species are known from *P. deflexa*. Formal description of this species is postponed until a larger study of *Cabirops* species is completed (Boyko and Williams, unpubl. data).

Suborder Flabellifera Sars, 1882

Family Aegidae Leach, 1815

Rocinela signata Schioedte and Meinert, 1879

Rocinela signata Kensley and Schotte, 1989: 120, 122, fig. 52d. Garzón-Ferreira, 1990: 813-815. Markham et al., 1990: 413–414.

Material examined.—One male (8.3 mm), Station 419R, 24°51′57.5″N, 77°53′20.1″W, pavement/back reef, 3.6 m, Andros Island, Bahamas, coll. C. B. Boyko et al., 5 Sep. 2000 (AMNH 18245).

Distribution.—Florida Keys; U.S. Virgin Islands; Bahamas; Jamaica; Haiti; Yucatán Peninsula, Mexico; Puerto Rico; Belize; Venezuela; Gulf of Mexico; Southern California and Gulf of California; Panama; Costa Rica (Kensley and Schotte, 1989); Colombia

(Garzón-Ferreira, 1990); Quintana Roo, Mexico (Markham et al., 1990); Tobago; Colombia (Kensley and Schotte, 1994).

Family Cirolanidae Dana, 1852

Subfamily Cirolaninae Dana, 1852

Cirolana parva Hansen, 1890

Cirolana parva Bruce and Bowman, 1982: 325–330, figs. 1,2. Kensley and Schotte, 1989: 135, figs. 59c–e, 60. Markham et al., 1990: 414. Müller, 1993a: 30–36, figs. 1–25. Delgado et al., 2000: 381–382.

Material examined.—One male (5.6 mm), Station 144 Q1, transect from 24°54′43.80″N, 77°52′56.92″W–24°54′43.21″N, 77°52′57.97″W, fore reef, 11.8 m, Andros Island, Bahamas, coll. P. M. Mikkelsen and G. Hendler, 28 Aug. 2000 (AMNH 18246). One female (6.1 mm), Station 145 Q5, transect from 24°54′47.34″N, 77°53′16.48″W–24°54′47.80″N, 77°53′15.47″W, reef crest, 1.5 m, Andros Island, Bahamas, coll. P. M. Mikkelsen and G. Hendler, 29 Aug. 2000 (AMNH 18247). One ovigerous female (6.4 mm), Station 145 Q4, 24°54′47.34″N, 77°53′16.48″W–24°54′47.80″N, 77°53′15.47″W, reef crest, 1.5 m, Andros Island, Bahamas, coll. P. M. Mikkelsen and G. Hendler, 29 Aug. 2000 (AMNH 18248). One male (5.9 mm), Station 145 Q3, transect from 24°54′47.34″N, 77°53′16.48″W–24°54′47.80″N, 77°53′15.47″W, reef crest, 1.5 m, Andros Island, Bahamas, coll. P. M. Mikkelsen and G. Hendler, 29 Aug. 2000 (AMNH 18249).

Distribution.—Appalachicola, Florida; Florida Keys and Dry Tortugas; St. Thomas; St. Croix; Puerto Rico; Cuba; Jamaica; Quintana Roo, Mexico (Bruce and Bowman, 1982); North Carolina; South Carolina; Turks and Caicos; Barbados; Belize; Panama; Gulf of Mexico (Kensley and Schotte, 1989); Quintana Roo, Mexico (Markham et al., 1990); Martinique (Müller, 1993a); Tobago; Dominica (Kensley and Schotte, 1994); Venezuela (Delgado et al., 2000); Bahamas (herein).

Remarks.—Bruce and Bowman (1982) and Müller (1993a) re-described this species in detail and confirmed that it is found only in the Caribbean region. Co-occurring isopods were *M. fasciata*, *P. infundibulata*, and *C. serricaudus* (Station 145 Q4), *Santia milleri* (Station 144 Q1). To our knowledge, this is the first record for this species from the Bahamas.

Subfamily Eurydicinae Stebbing, 1905

Metacirolana halia Kensley, 1984

Metacirolana halia Kensley and Schotte, 1989: 154, figs. 71d–f.

Material examined.—One female (1.3 mm), Station 011R, 24°51′32.0″N, 77°52′50.5″W, reef crest, 1.2–3.0 m, Andros Island, Bahamas, coll. C. B. Boyko et al., 5 Sep. 2000 (AMNH 18250).

Distribution.—Belize; Turks and Caicos; Bahamas; Jamaica; Cozumel, Mexico (Kensley and Schotte, 1989).

Metacirolana menziesi Kensley, 1984

Metacirolana menziesi Kensley and Schotte, 1989: 154, figs. 71a,b.

Material examined.—One specimen (3.1 mm), Station 043R, 24°53′01.6″N, 77°52′50.5″W, fore reef, 11.5 m, Andros Island, Bahamas, coll. P. M. Mikkelsen et al., 1 Sep. 2000 (AMNH 18251). One specimen (1.3 mm), Station 401R, 24°54′51.3″N, 77°53′19.0″W, fore reef, 11.5 m, Andros Island, Bahamas, coll. P. M. Mikkelsen et al., 5 Sep. 2000 (AMNH 18252).

Distribution.—Belize (Kensley and Schotte, 1989); Bahamas (herein).

Remarks.—Co-occurring isopods were *Mesanthura bermudensis*, and *Carpias* sp. (Station 043R). This is the first record for this species from the Bahamas.

Family Corallanidae Hansen, 1890

Excorallana delaneyi Stone and Heard, 1989

Excorallana delaneyi Stone and Heard, 1989: 199–204, figs. 1–8. Cantú-Díaz Barriga and Escobar Briones, 1992: 364, 366, fig. 3a–c.

Material examined.—One male (10.1 mm), ex *Halichondria melanadocia* de Laubenfels, intertidal, Forfar Field Station, Andros Island, Bahamas, coll. C. B. Boyko et al., 29 Aug. 2000 (AMNH 18253).

Distribution.—St. Joseph's Bay, Florida, Northeastern Gulf of Mexico (Stone and Heard, 1989); Terminos Lagoon, Quintana Roo, Mexico (Cantú-Díaz Barriga and Escobar Briones, 1992); Tobago (Kensley and Schotte, 1994); Bahamas (herein).

Remarks.—Our single specimen lacks lateral incisions in the pleotelson, possesses three large cephalic horns, and has well separated eyes. This combination of characters is found in only two western Atlantic *Excorallana*: *Excorallana delaneyi* and *Excorallana berbicensis* Boone, 1918. The main points of distinction between these two species, as given by Stone and Heard (1989), are that *E. delaneyi* has an acute or subacute frontal lamina, three and five spines on the lateral margins of the uropodal exopod and endopod, respectively, and a smaller body size, whereas *E. berbicensis* has a rounded frontal lamina, four and six spines on the lateral margins of the uropodal exopod and endopod, and larger body size. However, it was noted by Stone and Heard (1989) that the only two reliably identified specimens of *E. berbicensis* are sub-adult. This makes comparisons between the species difficult, as the small sample size for *E. berbicensis* gives no good measure of the intraspecific variation in that species. Additionally, a comparison between sub-adult male *E. berbicensis* and female *E. delaneyi* shows a remarkable similarity (compare Kensley and Schotte, 1989: fig. 74E with Stone and Heard, 1989: fig. 1). The fact that the frontal lamina of our specimen is of an intermediate shape between that of *E. delaneyi* and *E. berbicensis* (as shown by Stone and Heard, 1989), adds to the question of validity in maintaining these as two separate species, as does the now-recognized distribution of *E. delaneyi* extending eastwards into the Caribbean (see also Cantú-Díaz Barriga and Escobar Briones, 1992).

Because the Bahamas specimen matches *E. delaneyi* in all aspects (including the number of spines on the uropodal exopod and endopod), except the exact shape of the

frontal lamina, and comparative adult material of *E. berbicensis* is lacking, we identify it with the former species and suggest that investigation into the distinctness of these two species should be undertaken. In particular, the four males of *E. berbicensis* reported from Venezuela by Delgado et al. (2000) need to be examined.

Like some of the specimens of *E. delaneyi* listed by Stone and Heard (1989), our specimen was taken from inside a *Halichondria* sponge. This is the first record for this species from the Bahamas.

Family Sphaeromatidae H. Milne Edwards, 1840
Subfamily Sphaeromatinae H. Milne Edwards, 1840
Cymodoce ruetzleri Kensley, 1984

Cymodoce ruetzleri Kensley and Schotte, 1989: 227, 228, figs. 99c–g.

Material examined.—One female (4.3 mm), Station 144 Q2, transect from 24°54′43.80″N, 77°52′56.92″W–24°54′43.21″N, 77°52′57.97″W, fore reef, 11.8 m, Andros Island, Bahamas, coll. P. M. Mikkelsen and G. Hendler, 28 Aug. 2000 (AMNH 18254). One female (4.1 mm), one male (4.7 mm), Station 126 Q5, transect from 24°54′47.34″N, 77°53′16.48″W–24°54′47.80″N, 77°53′15.47″W, *Thalassia* seagrass bed, 3.0 m, Andros Island, Bahamas, coll. P. M. Mikkelsen and G. Hendler, 3 Sep. 2000 (AMNH 18255). One female (4.3 mm), Station 126 Q2, transect from 24°54′47.34″N, 77°53′16.48″W–24°54′47.80″N, 77°53′15.47″W, *Thalassia* seagrass bed, 3.0 m, Andros Island, Bahamas, coll. P. M. Mikkelsen and G. Hendler, 3 Sep. 2000 (AMNH 18256). One male (4.9 mm), Station 415R, 24°53′32.2″N, 77°53′51.4″W, thick *Thalassia* seagrass, 3.6 m, Andros Island, Bahamas, coll. C. B. Boyko et al., 4 Sep. 2000 (AMNH 18257).

Distribution.—Belize (Kensley and Schotte, 1989); Bahamas (herein).

Remarks.—Co-occurring isopods included *C. punctatus*, *A. desultor*, *C. choprae*, *P. ? occidentalis*, *Cabirops* sp. A, and *P. caudata* (all Station 415R). This is the first record for this species from the Bahamas.

Subfamily Dynameninae Bowman, 1981
"Dynamenella" angulata Richardson, 1901

Dynamenella angulata Kensley and Schotte, 1989: 214, fig. 93e. Delgado et al., 2000: 385.

Material examined.—One female (5.7 mm), Blue Hole, transect from 24°54′47.34″N, 77°53′16.48″W–24°54′47.80″N, 77°53′15.47″W, *Caulerpa* and algae on rock, 2.7 m, P. M. Mikkelsen and G. Hendler, Andros Island, Bahamas, coll. P. M. Mikkelsen and G. Hendler, 31 Aug. 2000 (AMNH 18258).

Distribution.—No Name Key, Florida (Kensley and Schotte, 1989); Venezuela (Delgado et al., 2000); Bahamas (herein).

Remarks.—This species has only been provisionally assigned to this genus, as all known specimens were females (Kensley and Schotte, 1989). However, Delgado et al. (2000) indicated that they collected a male specimen from Venezuela, but did not figure or describe it. Examination of that specimen may conclusively indicate the generic af-

filiation of this species, if it is correctly identified. This is the first record for this species from the Bahamas.

Paracerceis caudata (Say, 1818)

Paracerceis caudata Kensley and Schotte, 1989: 219, fig. 96. Markham et al., 1990: 415. Delgado et al., 2000: 382–383.

Material examined.—One female (3.5 mm), fore reef, Station 141, 24°52′34.61″N, 77°52′39.31″W, fore reef, mixed algae sample (mainly *Halimeda*, but several species), 27.3 m, Andros Island, Bahamas, coll. G. Hendler, 26 Aug. 2000 (AMNH 18259). Three females (2.6–4.7 mm), Station 120 Q1, transect from 24°54′47.34″N, 77°53′16.48″W–24°54′47.80″N, 77°53′15.47″W, patch reef, 2.4 m at crest, Andros Island, Bahamas, coll. P. M. Mikkelsen and G. Hendler, 30 Aug. 2000 (AMNH 18260). One male (4.7 mm); one female (3.3 mm), Station 415R, 24°53′32.2″N, 77°53′51.4″W, thick *Thalassia* seagrass, 3.6 m, Andros Island, Bahamas, coll. C. B. Boyko et al., 4 Sep. 2000 (AMNH 18261).

Distribution.—Bermuda; New Jersey to Florida Keys; Yucatán to Venezuela; Turks and Caicos; Cuba; Puerto Rico; Bahamas; Jamaica; Haiti; St. Maartens; St. Lucia; Gulf of Mexico (Kensley and Schotte, 1989); Quintana Roo, Mexico (Markham et al., 1990); Tobago; Dominica; Colombia (Kensley and Schotte, 1994); Venezuela (Delgado et al., 2000).

Remarks.—Co-occurring isopods at Station 415R included *C. punctatus, A. desultor, C. choprae, P.* ? *occidentalis, Cabirops* sp. A, and *C. ruetzleri* (Station 415R) and *Carpias* sp., *J. rathbunae,* and *H. bowmani* (Station 120 Q1).

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Appendix

Species of *Pseudione* Kossmann, 1881, Parasitizing Hermit Crabs

P. biacuta Bourdon, 1979, Uruguay, on *Paguristes robustus* Forest and de Saint-Laurent (Bourdon, 1979).

P. brandaoi Brian and Darteville, 1941, Congo, on *Clibanarius* sp. (Brian and Dartevelle, 1941)

P. calcini Shiino, 1958, Japan, on *Calcinus latens* (Randall) (Shiino, 1958).

P. clibanaricola Shiino, 1933, Japan, on *Clibanarius bimaculatus* (De Haan) (Shiino 1933).

P. giardi Calman, 1898, Puget Sound, Washington, U.S., on *Pagurus armatus* (Dana) (erroneously called *Pagurus ochotensis* Brandt by Calman, 1898 and Bonnier, 1900; see McLaughlin, 1974: 58); Washington and Alaska, U.S., on *Pagurus ochotensis* Brandt; Alaska, USA, on *Pagurus capillatus* (Benedict), *Pagurus aleuticus* (Benedict), *Pagurus hirsutiusculus hirsutiusculus* (Dana), and *Pagurus beringanus* (Benedict) (Markham, 1975b); the record of this parasite from the Straits of Georgia, on *Munida* sp. (= *M. quadrispina* Benedict), given by Nierstrasz and Brender à Brandis, 1931, actually refers to *Pseudione galacanthae* Hansen (see Markham, 1975b).

P. hyndmanni (Bate and Westwood, 1868), Ireland, on *Pagurus bernhardus* (Linneus) (Bonnier, 1900); Scotland, on *P. prideaux* Leach (Henderson, 1886, as *Bopyrus* sp., fide Markham, 2003); England, on *Pagurus pubescens* Krøyer (Nierstrasz and Brender à Brandis, 1926); France, on *P. bernhardus*, *Anapagurus laevis* (Bell), and *A. chiroacanthus* (Lilljeborg) (Bourdon, 1968); Norway, on *P. pubescens* (Bourdon, 1968); Japan, on *Pagurus* sp. (Shiino, 1936) and *P. middendorfi* Brandt (Shiino, 1958) (as *Parapseudione lata* (Shiino, 1958); 45°32′N, 04°12′W, on *Anapagurus laevis* (Bell) (Dollfus and Carayon, 1942); New Zealand, on *Lophopagurus* (*L.*) *lacertosus* (Henderson) (Page, 1985, as *L. crenatus* (Borradaile)).

P. intermedia Nierstrasz and Brender à Brandis, 1932, Japan, on *Lophopagurus* (*Australeremus*) ?*triserratus* (Ortmann) (Shiino, 1936, as *Eupagurus ?triserratus*) and *Pagurus* sp. (Shiino, 1972).

P. nobilii Nierstrasz and Brender à Brandis, 1923, Japan, on *Trizocheles spinosus* (Henderson) (Nierstrasz and Brender à Brandis, 1923, as *Mixtopagurus spinosus*).

P. novaeguineensis Danforth, 1971, New Guinea, on *Clibanarius* sp. aff. *longitarsus* (De Haan) (Danforth, 1971).

P. quasimodo new species, Andros Island, Bahamas, on *Paguristes grayi* Benedict and *Paguristes invisisacculus* McLaughlin and Provenzano (herein).